Analyzing The Relationship Between The Secondary School Students' Attitudes Towards The Educational Computer Games, And Their Reflective Thinking Skills

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ABSTRACT
The aim of this study is to reveal the relationship between the secondary school students' attitudes towards the educational computer games, and their reflective thinking skills. As the model of the research, it's utilized from the correlational research model. The target population of the study consists of secondary school students that receive education in city center of Siirt. And the sample that is composed of 653 students in total, being as 262 girls and 391 boys, is determined according to the appropriate sampling method among the selective sampling methods. A personal information form which includes variables like gender, class, computer and internet ownership status of the students who participated to the research; the "*The Educational Computer Games Attitude*" scale developed by Çankaya and Karamete (2008), and the "*Reflective Thinking Skills Towards Problem Solving*" scale developed by Kızılkaya and Aşkar (2010) were used as the data collection tools. In the analysis of data, in order to determine the students' attitudes towards the educational computer games and reflective thinking skill levels, the descriptive statistics; to determine the relationship between the variables, the correlation analysis; and to determine the predictive power, the linear regression analysis are used. At the end of the research, it's determined that there is a significant relationship positively and in an intermediate level between attitudes towards the educational computer games' and reflective thinking skills' levels. Also, it's observed that attitude towards the educational computer games is a significant predictor of the students' reflective thinking skill levels.
Keywords: The educational computer games, secondary school students, reflective thinking, attitude

INTRODUCTION
The emerging developments in the educational technology requires the learning environments in the teaching process to be rearranged in such a way that enable the student-centered applications. Prensky (2002) indicated that, in the 21st century, the most important innovations can be possible only by making the education enjoyable (qtd. in: Tüzün 2006). This can be maintained easily by the educational computer games. The educational computer games provides environments where students can spend enjoyable times and also learn important information for themselves. According to Güngörmüş (2007), the educational computer games are the softwares that the lesson contents which are intended to be thought to the students are prepared in a game format. And Hwang et al. (2012) state the educational computer games as softwares designed according to the students' interests and motivations in order to reach the educational goals. Pinnell (2015) states it as entertaining environments that make the students show interest to the lesson content by developing their will and interest towards learning. Within this scope, when related terms in the body of literature are reviewed, the educational computer games are the introduced environments that will empower the students' learning experience, make them concentrate on learning contents, encourage them to learn, improve their self confidence, increase their creativeness and provide visual, tactual and intellectual stimulus (Bouzid, Khenissi, Essalmi and Jemni, 2016; Calvo- Ferrer, 2016; Peterson, 2016). When the literature regarding the educational computer games is analyzed; in the study where the educational

computer games effect on students' academic success is analyzed Yağız (2007) indicated that there is a significant difference in favor of students' academic success. Kula (2005), in his study analyzing the effect of the educational computer games on students' basic transaction skills, determined that the educational computer games have a significant effect on students' basic transaction skills' development. In the study carried out by Papestrergiou (2008), he stated that the educational computer games have a significant effect on students' learning and motivation levels. It's declared that the educational computer games develops students' characteristics like decision-making, discussing and affective bonding by revealing their imagination (Prensky (2008). Hence, it's stated that, a learning environment is formed by the educational computer games, where the student forms its own knowledge, and which sees the relations between these knowledges and the previous ones, organizes the knowledge and produces new ones, and grounds on the constructivist learning approach (Bakar, Tüzün and Çağıltay, 2008).

Lately, by the developing learning technologies, the usage of the educational computer games in teaching environments by utilizing from its entertaining and motivating feature shows an increasing tendency (Egenfeldt-Nielsen, 2010). Along with this, Kirriemuir and McFarlane (2004) indicate that the educational computer games can be used conveniently for students in making them gain cognitive skills like reflective thinking, planning , struggling, competing, communicating and decision-making. It's also stated that the educational computer games visualize the abstract concepts hard to learn, and this way reduce the learning anxiety (Chen et al., 2012; Sönmez and Artut, 2011). Also, it's emphasized that educational computer games improve students' creative and reflective thinking skills (Can and Çağıltay, 2006), help to improve their problem solving and reflective thinking skills (Demirel, Seferoğlu and Yağcı, 2003).

Rodgers (2002) defines the reflective thinking as a smart action movement that is based on analyzing, which reveals as a result of the experiences, while John Dewey (1993) defines the reflective thinking as active and terminal learning process that is based on the cause and effect relation of the related information. John Dewey (1993) lists the characteristics the individuals should have in order to carry out the reflective thinking as being open-minded, tam willingness and responsibility. Kızılkaya and Aşkar, (2010) stated that reflective thinking reveals by the result of perceiving the problem and can be monitored most easily during the problem solving process. Hence, it's observed that the reflective thinking skill towards problem solving is an improvable skill but a range of supportive strategies are needed for this. These supportive strategies include strategies like asking questions by oneself, constructing one's knowledge by its own statements, decision-making, planning and self-assessment, and also can support by a range of educational computer games. In the body of literature, it's possible to come across with many studies on both the educational computer games and the reflective thinking skill. But in the body of literature, studies analyzing directly the relationship between the attitudes towards the educational computer games and the reflective thinking skill of the secondary school students have not been come across with. The research arose from the need of filling this gap in the body of literature and analyzing the relationship of the attitudes towards the educational computer games and the reflective thinking skill of the secondary school students.

Aim Of The Study
In this research, the aim is determining the relationship between the secondary school students' attitudes towards the educational computer games and the reflective thinking skills. With this common aim, it was searched for answers for the below questions:

1- Is there a relationship between the secondary school students' attitudes towards the educational computer games and the reflective thinking skill?
2- Are the secondary school students' attitudes towards the educational computer games predicting the reflective thinking skills?
3- Do the secondary school students' attitudes towards the educational computer games and the reflective thinking skills' levels show a significant difference due to the variables as gender, class, computer and internet ownership at home status?

METHOD
Research Model
In this research, correlational research method is used.

Target Population and Sampling
The target population of the research is composed of the students who receive education in the secondary schools in the city center of Siirt affiliated to Provincial Directorate for National Education, in 2015-2016 school year's spring term. Its sample is composed of 653 students receiving education in four schools determined by the appropriate sampling among selective sampling methods. Findings concerning the demographical features of the students that participate to the study are given in Table 1.

Table 1. *Distribution of the students according to their demographical features*

Demographical Feature	Category	N	Percentage (%)
Gender	Boys	391	59,9
	Girls	262	40,1
Class level	5. grade	183	27,9
	6. grade	156	23,9
	7. grade	147	22,5
	8. grade	168	25,7
Computer ownership status	Available	594	91
	Unavailable	59	9
Internet ownership status	Available	346	53,1
	Unavailable	307	46,9

When Table 1 is reviewed, regarding the students participating to the research, 40,1% of the students are boys and 59,9% of them are girls. 27,9% of them are 5th grade students, 23,9% are 6th grade, 22,5% are 7th grade and 25,7% of them are 8th grade students. 91% of the same students own a computer at home and 9% of them do not. In addition, it's determined that 53% of the students have internet connection at home, and 46,9% of them do not.

Data Collection Tool
A personal information form which includes demographical information of the students; the "*The Educational Computer Games Attitude*" scale developed by Çankaya and Karamete (2008), and the "*Reflective Thinking Skills Towards Problem Solving*" scale developed by Kızılkaya and Aşkar (2010) were used as the data collection tools. Attitudes towards the educational computer games scale is a five point likert scale, and consists of 5 items. The Cronbach alpha reliability coefficient is stated as .66. In our study, the Cronbach alpha internal reliability coefficient of the scale was calculated as .84. And the reflective thinking skills towards problem solving scale is a five point likert scale, and consists of 14 items and 3 dimensions: causation, questioning and assessment. The developed scale's Cronbach alpha internal reliability coefficient for the whole scale, from the sub-dimension of .83, is indicated as .71 for causation, .73 for questioning and .69 for assessment. And in the study we carried out, the Cronbach alpha internal reliability coefficient of the scale was calculated as .75. For the sub-dimensions, it's calculated as .68 for causation, .73 for questioning and .66 for assessment.

The Analysis of Data
In the analysis of data gathered in the research, SPSS 22.0 statistical data analyze program is used. Also, to determine the relationship between students' attitudes towards the educational computer games and reflective thinking skills, arithmetic mean, standard deviation, correlation and regression analysis techniques are used. In order to determine if the students' attitudes towards the educational computer games and the reflective thinking skills differ or not according to the gender, class, computer and internet ownership at home status variables, independent samples t-test and one-way Analysis of Variance (ANOVA) are used. To determine the root of the intergroup difference, it's utilized from the Turkey-HSD test.

FINDINGS

In order to determine the relationship between attitudes towards the educational computer games and reflective thinking skills of students who participated to the research, the findings obtained are shown as below. The results concerning the secondary school students' attitudes towards the educational computer games and reflective thinking skills are given in Table 2.

Table-2. The results concerning the secondary school students' attitudes towards the educational computer games and reflective thinking skills (n=653)

	$\bar{x}$	sd
Attitude towards the educational computer games	2.95	.636
Reflective thinking skill	3.06	.671
Causation	2.96	.815
Questioning	3.12	.762
Assessment	3.07	.799

As can be seen in Table 2, the arithmetic mean of the scores that secondary school students got from the students' attitudes towards the educational computer games scale is found as 2.95 and the arithmetic mean of the scores that they got from the reflective thinking skill scale is found as 3.06. When arithmetic means of the sub-dimensions of the students' reflective thinking skill, the determined scores are 2.96 for causation sub-dimension, 3.12 for questioning sub-dimension, and 3.07 for assessment sub-dimension. It's observed that scores of the students' attitudes towards the educational computer games and the reflective thinking skills are in an intermediate level. The results regarding the relationship between the secondary school students' attitudes towards the educational computer games and the reflective thinking skills are given in Table 3.

Table 3. The results regarding the relationship between the students' attitudes towards the educational computer games, and the reflective thinking skills towards the problem solving levels.

	Attitude towards the educational computer games
Causation	.620**
Questioning	.549**
Assessment	.609**
Reflective thinking skills	.698**

** p<.01

As can be seen in Table 3, a positively and significant relationship between the secondary school students' attitudes towards the educational computer games and the reflective thinking skills' levels (r=,698; p<.01) are determined. And when the relationship between the causation, questioning and assessment, which are the sub-dimensions of the reflective thinking skill of the students, and the attitudes towards the educational computer games, there is again a significant relationship positively and in an intermediate level between the sub-dimensions causation (r=.620; p<.01), questioning (r=.549; p<.01) and assessment (r=.609;p<.01), and the attitudes towards the educational computer games. The regression analysis results concerning reflective thinking skills towards problem solving's prediction of the students' attitudes towards the educational computer games are given in Table 4.

Table 4. The regression analysis results concerning reflective thinking skills towards problem solving's prediction of the students' attitudes towards the educational computer games.

Predicted Variable	Predictor Variable	Reg. Kat.	St. Error	R	R²	Stable	t	P
Reflective Thinking Skill	Attitude Towards The Educational Computer Games	0,737	0,030	0,698	0,488	0,698	24,887	,000

As can be seen in Table 4, it's observed that according to the regression analysis results, the secondary school students' attitudes towards the educational computer games are a significant predictor of the reflective thinking skills (R=0,698, R²=0,488; p<.01). According to this, it's determined that 48% of

the total variance concerning the students' reflective thinking skills is explained by the attitude towards the educational computer games. The results of the t-test carried out in order to determine if there is a significant difference in the secondary school students' attitudes towards the educational computer games or not, according to the variables as gender, class, computer and internet ownership at home status, are given in Table 5.

Table 5. T-test results of the attitude towards the educational computer games and reflective thinking skills concerning variables as gender, computer and internet ownership status

Variables			Attitude Towards The Educational Computer Games				Reflective Thinking Skills		
		N	x̄	sd	t		x̄	sd	t
Gender	Male students	391	3,03	,682			3,06	,711	
	Female students	262	2,83	,540	3,87**		3,06	,608	-0,14*
Computer ownership status	Available	594	2,95	,618			3,23	,486	
	Unavailable	59	2,,95	,651	-0,08*		3,04	,685	-2,01**
Internet ownership status	Available	346	3,00	,618	-2,08**		3,13	,672	-2,67**
	Unavailable	307	2,90	,651			2,99	,664	

*p>.05; **p<.05

As can be seen in Table 5, among the students who participated to the research, according to their gender, it's determined that there is a significant difference in favor of male students (t=3,87; p<.05) between the attitudes towards the educational computer games; and according to the internet ownership status, it's determined that there is a significant difference in favor of "Available" (t=-2,08; p<0.05) between the attitudes towards the educational computer games. Notwithstanding, it's determined that there is no significant difference between the students' computer ownership status and attitudes towards the educational computer games (t=-0,08; p>0.05). As can be seen in Table 5, when the t-test results of the students' reflective thinking skills concerning the variables as gender, computer and internet ownership status are analyzed, it's determined that there is no significant difference according to the gender variable (t=-0,14; p>.05); but there is a significant difference in favor of " Available" according to the students' computer (t=-2,01; p<.05) and internet (t=-2,08; p<.05) ownership status. Findings concerning the arithmetic mean and standard deviation results regarding the students' attitudes towards the educational computer games and reflective thinking skills according to the class level variable are given in Table 6.

Table 6. The arithmetic mean and standard deviation results regarding the students' attitudes towards the educational computer games and reflective thinking skills according to the class level variable

Class level variable		Attitude Towards The Educational Computer Games		Reflective Thinking Skill	
	N	x̄	sd	x̄	sd
5.grade	182	3.13	.634	3.29	.653
6. grade	156	2.78	.523	2.85	.594
7. grade	147	2.77	.604	2.92	.639
8. grade	168	3.06	.682	3.14	.698

As it can be seen in Table 6, the arithmetic mean of the students' attitudes towards the educational computer games according to the class (level) variable is determined as 3.13 for the 5th grade, 2.78 for the 6th grade, 2. 77 for the 7th grade, and 3.06 for the 8th grade. And when the arithmetic mean of the students' reflective thinking skills level according to the class (level) variable is analyzed, it's determined as 3.29 for the 5th grade, 2.85 for the 6th grade, 2.92 for the 7th grade, and 3.14 for the 8th grade. The ANOVA analyses and Turkey-HSD results concerning the differences between arithmetic

means of the students' both attitudes towards the educational computer games, and the reflective thinking skills, according to their class level variable, are given in Table 7.

Table -7. The ANOVA analyses and Turkey-HSD results concerning the students' attitudes towards the educational computer games and reflective thinking skills

	Source of the Variance	Sum of squares	sd	Average of squares	F	Turkey-HSD
Attitude towards the educational computer games	Intergroup	17,46	3	5,82	15.330**	5-8
	Intra-group	249,48	649	,380		6-7
	Total	263,95	652			
Reflective thinking skill towards problem solving	Intergroup	20,44	3	6,81	16,18**	5-8
	Intra-group	273,36	649	,421		6-7
	Total	293,81	652			

**p <.01

As can be seen in Table 7, significant differences are determined between the secondary school students' current class level and both their attitudes towards the educational computer games (F=15,33;p<.01) and the reflective thinking skills (F=16,18;p<.01). In the result of the Turkey HSD test carried out to determine the source of the significant difference, both the attitude towards the educational computer games and the reflective thinking skills towards problem solving are determined between the 5th grade to 8th grade, and between the 6th grade to 7th grade.

THE ARGUMENT AND THE RESULTS
At the end of the study, it's observed that the secondary school students' attitudes towards the educational computer games, who participated to the research, and the reflective thinking skills have a significant relationship positively and in an intermediate level between each other. And this state can be interpreted as the reflective thinking skills can be improved when the students' attitudes towards the educational computer games are enhanced. When similar studies done on the body of literature are analyzed; in the study carried out by Donmuş and Gürol (2015), it's indicated that the educational computer games have a positive impact on the students' permanence and access levels. In a study done by Topçu, Küçük and Göktaş (2014), they indicated that the educational computer games make the students' learning more permanent, and improve their thinking skills by visualizing the concepts and reinforcing the knowledges learnt.

When the students' attitudes towards the educational computer games are analyzed in terms of various variables, a significant difference in favor of the male students is observed in the variables of internet connection and gender. Internet connection ownership of the students can be interpreted as this may enhance their attitudes towards the educational computer games and a higher enhancement may occur in male students' attitudes. In a study done by Çankaya (2007), a difference occurring in favor of male students in the students' attitudes towards the educational computer games, and in a research done by Egenfeldt-Nielsen (2004), the internet connection's effect occurring on the school students' attitudes towards the educational computer games, correspond to the findings of this research. In addition, according to the variables as the gender, and the computer and internet ownership at home status, no significant difference is observed in students' reflective thinking skills, but in the class level variable, significant differences in favor of 8th and 5th grades are determined.

Nevertheless, within the research, it's observed that attitude towards the educational computer games is a significant predictor of the reflective thinking skill. It's thought that this situation originates from presenting the experience and questioning based activities of the educational computer games together with the entertaining feature (Tüzün et al., 2006). In this regard, the reflective thinking skill's state of being a skill based on questioning where the mistakes and corrects are determined by analyzing (Dewey, 1993), promotes this opinion. And this shows that the educational computer games should be overemphasized regarding the increasement of its efficiency. As there are no studies in the literature analyzing directly the relationship between the attitude towards the educational computer games and the reflective thinking skill, as the research results have not been compared enough with other research's findings, and as the study was carried out with a limited number of students that receive

education in secondary school level, all these can be considered as a limitation. In studies to be done according to this, it is possible to utilize from a wider community that receive different levels of education.

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